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ABSTRACT

Previous research has indicated that a student's attitude toward mathematics has a significant influence upon that student's level of mathematics achievement. Consequently, the promotion of positive student attitudes toward mathematics should be an important goal, not only for the educator, but also for the parents. The purpose of this study was to investigate and determine the extent of the relationship between both parents' and students' attitudes toward mathematics, as measured by the Dutton Attitude Scale, and students' level of achievement (high, average, or low) in mathematics, as measured by the California Achievement Test (Mathematics Form E). The subjects involved were 220 third-grade students and their parents, comprising nine classes; four classes were heterogeneously grouped into self-contained settings, whereas the remaining five classes were heterogeneously grouped into departmentalized settings. The findings indicated that there was no significant correlation between mothers' attitudes toward mathematics and students' attitudes toward mathematics; however, a significant negative correlation was found between fathers' attitudes toward mathematics and students' attitudes toward mathematics. Further, no significant relationships were discovered between the students' level of mathematics achievement and any of the three measures of attitudes towards mathematics; nonetheless, implications of a direct influence of parental attitudes upon student achievement were indicated. (JJK)

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SE 052 165

Parent and Student Attitudes Toward Mathematics As They Relate to Third Grade Mathematics Achievement

Dr. Marlene Cain-Caston

Abstract

This study was to determine the extent of the relationship between parents' and students' attitudes toward mathematics and students' achievement in mathematics; and to compare, by sex and performance levels (high, average, low), the attitudes toward mathematics of third grade students. The Dutton Attitude Scale and the California Achievement Test, Mathematics Form E, were utilized. The finding of this investigation implies there is no significant relationship between mothers' attitudes towards mathematics and students' attitudes towards mathematics although significance was found between fathers' and students' attitudes towards mathematics. In education, an important influence on achievement in a subject is attitude towards that subject. Therefore, an important goal of the parent and the educator is to promote positive attitudes toward mathematics in order that students will develop positive attitudes toward mathematics.

Some writers contend that there is a degree of incompatibility in maximizing both desired cognitive and affective outcomes in pupils. Indirect conflict is the contention expressed in literature relating to elementary school mathematics that the promotion of desired cognitive outcomes (or achievement) in pupils is dependent on the prior promotion of desired affective outcomes, such as favorable attitudes toward the subject (Schofield, 1981).

One of the conditions that facilitates a person's continuance in an activity is a sense of positive well-being and success in the activity. Even though one of the objectives of education is to internalize success, several studies (e.g., Sherman and Fennema 1979) indicated that females evaluate themselves on the basis of how a significant other (i.e., parent, teacher, or peer) perceives them. Females appear to need overt encouragement indicating that they are proceeding correctly. In fact, it is probably true that the absence of any comment or responsive action on the part of a teacher is construed as a negative response. The essential characteristic of using positive reinforcement is that the teacher takes advantage of every opportunity to reinforce in the student the idea that he or she is indeed doing a good job or is capable of doing good work.

Closely related to the concept of positive reinforcement is the concept of self-confidence. The statistics presented indicated that confidence in learning mathematics correlated

higher mathematics achievement than did any other attitude. Since it is possible to argue that the decline in the scores of females on confidence in mathematics could be an effect as well as a cause of the decline in mathematics achievement scores, it is reasonable to look to mathematics achievement as a means of developing self-confidence in students. Aiken (1970) supports this position in noting that most attempts to change attitudes toward mathematics will not be effective if students are not successful in mastering the subject.

A study by Knaupp (1970) investigated the achievement and attitude of second grade students using two modes of instruction and two manipulative models for the numeration system. The main objectives of this study were to measure the attitudes of second grade students toward specific activities used during arithmetic instruction. Although most of the children enjoyed the experiment, no changes were found in their general attitudes toward arithmetic.

The purpose of this investigation was to determine the extent of the relationship of parents' and students' attitudes toward mathematics (as measured by the Dutton Attitude Scale) and students' achievement in mathematics (as measured by the California Achievement Test); and to compare by sex and performance levels (high, average, low) the attitudes toward mathematics of third grade children.

METHOD

Subjects

The subjects were 220 third grade students and their parents. The students were in nine sections. Four classes were heterogeneously grouped into self-contained settings. Five classes were heterogeneously grouped into departmentalized settings.

The 220 students were administered the California Achievement Test in second grade and divided into performance levels based on each student's stanine score on the reading skills composite form. Students were randomly assigned by sex performance rating when they arrived in third-grade (high, average, low). The students comprising the total population and sample were mixed-black and white males and females. Twenty-six percent of the students were black males and twenty-six of the students were black females. Twenty-seven percent of the students were white males and twenty-one percent of the students were white females.

Measures

The Dutton Attitude Scale was utilized as one of the research instruments in this study. The 22 items in this scale are designed to measure student and teacher attitudes toward arithmetic. With the advent of the "modern" mathematics, the term "arithmetic" in the elementary school curriculum has largely been replaced by the term "mathematics". This is the case in the school where the study was conducted. As such,

the word "mathematics" replaced "arithmetic" in the scale where ever the latter appeared. Traditionally, the respondent, in taking Dutton's scale, has been asked to check those statements that he agreed with and not to mark at all those that he disagreed with. In this study the respondent was ask to respond to each statement by circling one of two symbols that best represented his position or attitude on each statement. The possibilities were "yes" for agree, and "no" for disagree. This variation was used based upon Fedon's success with his modifications and also due to the recognized possibility that third grade students would not read each statement carefully if a specific response was not called for. The researcher obtained a reliability index for the Dutton Attitude Scale and the modified form. Approximately 90 third grade students and their parents were used. On the parens attitude scale 11 statements were preceded by the words "when I was in school". For the Dutton Attitude Scale an alpha of .67 was obtained. For the modified form an alpha of .86. Both indexes were significant beyond the .05 level.

The California Achievement Test, Mathematics Achievement, Form E, Level 13, 1986, was also utilized as a research instrument. The 92 items in this test are designed to measure achievement in the basic skills commonly found in state and district curricula. The test covers two areas: Computation Skills in addition, substraction, multiplication, and division of whole numbers; and concepts and applications. Specific

skills include concepts dealing with numeration, problem solving, measurement, and geometry. Only the mathematics composite score was used in this study.

Procedure

The Dutton Attitude Scale was administered to all students by individual teachers.

A modified version of the Dutton Attitude Scale was sent to the parents of all subjects.

The California Achievement Test was administered to all students.

Initial contact was made with the teachers involved in this study through the researcher. Visits were made to the classrooms to meet the teachers and students in an informal setting. The researcher later conducted in-service sessions with the teachers of the children to be involved in the study. They were completely informed about the process of the investigation.

Weekly contact was made with the teachers concerning the project and to keep an open line of communication for any questions the teachers might have.

The investigation was conducted for fifteen weeks. Following the first two weeks of school the researcher instructed the teachers to administer the Dutton Attitude Scale to all students. The testing session lasted an average of 15 minutes.

A modified version of the Dutton Attitude Scale was sent to the parents of 220 subjects. Parents were written a letter explaining the educational research study and thanking them for their participation.

A week before the investigation was to end, each student was administered the California Achievement Test. The testing session lasted an average of 60 minutes.

RESULTS

Raw score data were obtained from both the Dutton Attitude Scale and the California Achievement Test, Form E, Level 13, 1985, and utilized for purposes of statistical analysis. The Spearman rank-order correlation analysis was conducted to determine the relationship between students' and parents' attitudes toward mathematics and students' achievement in mathematics.

An analysis of the data in Table 4 indicates that there was no significant relation between students' attitudes toward mathematics and students' achievement in mathematics. (rho = -.0430, p = .264).

There was a significant relationship between students' attitudes toward mathematics and fathers' attitudes toward mathematics (rho = -.1917, p = .003).

INSERT TABLE 4 HERE

The negative relationship indicates that fathers' and students' have a tendency to score at opposite ends of the scale. If students attitudes are positive, fathers' attitudes tend to be negative. If fathers' attitudes are positive, students attitudes tend to be negative. The overall mean of the fathers was 11.5 (Table 5) and the overall mean of the students was 14.4 (Table 6).

INSERT TABLE 5 HERE

INSERT TABLE 6 HERE

There was no significant relationship between mothers' attitudes and students' attitudes toward mathematics (rho = -.007, p = .46). The overall mean of the students was 14.4 (Table 6) and the overall mean of the mothers was 13.3 (Table 7).

INSERT TABLE 7 HERE

An analysis of the data in Table 4 indicates that there was a significant relationship between fathers' and mothers' attitudes toward mathematics (rho = .2979, p = .00).

A Kruskal-Wallis one-way analysis of variance was utilized to determine if there was a significant difference in the mathematical performance levels,(high, average, low) of third grade students on attitudes toward mathematics.

Table 8 indicates that there was no significant difference in the mathematical performance levels (high, average, low) of third grade black male students on attitudes toward mathematics (p = 0.2858) at .05 level of significance.

INSERT TABLE 8 HERE

Date in Table 9 indicates that there was no significant difference in the mathematical performance levels (high, average, low) of third grade white male students on attitudes toward mathematics (p = 0.4312) at the .05 level of significance.

INSERT TABLE 9 HERE

An analysis of the data in Table 10 indicates that there was no significant difference in the mathematical performance levels (high, average, low) for third grade black female students on attitudes toward mathematics (p = 0.6917).

INSERT TABLE 10 HERE

The data in Table 11 indicates that there was no significant difference in the mathematical performance levels (high, average, low) of third grade white female students on attitudes toward mathematics.

INSERT TABLE 11 HERE

DISCUSSION

The results of this study indicate that parental attitudes are not the only determining factor of students' attitudes and students' performance. In testing hypothesis one, the results indicated that there was no significant relationship in students' toward mathematics and students' achievement in mathematics of third grade students.

There was evidence of a negative difference between fathers' attitudes toward mathematics and student's attitudes toward mathematics. Research indicates that attitudes a student acquires are to a degree influenced by his immediate family (Tocco, 1971, p. 5). If this is true, students would bring those negative attitudes to school. This study indicates that students' attitudes were positive although fathers' attitudes were negative. It is possible that those

negative attitudes were changed by teachers or peers.

There was no significant relationship between the attitudes of students and the attitudes of mothers. Research indicates that mothers spend more time helping students with homework. This might account for the similar attitudes.

Based on the research conducted, there is no significant difference in the mathematical performance levels (high average, low) of third grade students on attitudes toward mathematics.

IMPLICATIONS FOR EARLY CHILDHOOD EDUCATION

Based on research to-date, the major factors influencing student mathematical achievement remain difficult to predict. However, certain implications are noted which might strongly influence positive attitudes toward mathematics, thereby directly affecting mathematical achievement.

The Early Childhood Education curriculum must be geared to insure that positive attitudes toward mathematics exist, even at this early stage, in order that growth experiences are properly provided. Curriculum modifications can then be adjusted in order that these positive attitudes remain constant.

Basic education programs for prospective mathematics teaches must develop within these trainees a positive attitude toward selected subject matter. Pre-requisite of the teacher training program must be a positive attitude of the student is allowed to remain in such a program.

The classroom teacher must be provided with a constant and on-going, in-service attitude training program in order that attitudes become and remain positive toward mathematics. The administration must insure that teacher burn-out does not occur if mathematics achievements is to remain high. If negative attitudes are suspected, special incentives must be provided to change them to positive attitudes.

Knowing that parental attitudes toward mathematics are directly related to student achievement, in-service training programs must be provided for parents through the local Parent Teacher Associations.

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TABLE 4

SPEARMAN CORRELATION COEFFICIENTS

BETWEEN ATTITUDES OF STUDENTS,

MOTHERS, FATHERS, AND CAT OF STUDENTS

CAT = California Achievement Test

	Students' Attitudes	Mothers' Attitudes	Fathers' Attitudes
Mothers' Attitudes	-.0070 N(208) Sig.460		
Fathers' Attitudes	-.1917 N(199) Sig.003	.2979 N(199) Sig.000	
CAT of Students	-.0430 N(218) Sig.264	.0447 N(206) Sig.262	-.0346 N(197) Sig.315

TABLE 5

ATTITUDE LEVELS OF FATHERS

BY RACE, SEX, AND READING LEVELS OF STUDENTS

Race/Sex/Reading Levels		Mean	Std. Dev.	Cases
For Entire Population		11.5472	2.8563	199
Race	Black	11.7596	2.7146	104
Sex	Male	11.7143	2.7538	49
Level	1 Low	12.6667	2.6346	18
	2 Ave.	10.7273	2.6037	22
	3 High	12,2222	2.8186	9
Sex	Female	11.8000	2.7039	55
Level	1 Low	12.0000	2.2211	16
	2 Ave.	11.2593	2.7117	27
	3 High	12.7500	3.1659	12
Race	White	11.3053	3.0003	95
Sex	Male	11.0545	2.9778	55
Level	1 Low	11.6923	2.1364	13
	2 Ave.	10.3846	3.3236	26
	3 High	11.6250	2.8954	16
Sex	Female	11.6500	3.0344	40
Level	1 Low	12.3333	4.1633	3
	2 Ave.	11.8333	3.0101	12
	3 High	11.4800	3.0430	25

TABLE 6

ATTITUDE LEVEL OF STUDENTS BY

RACE, SEX, AND READING LEVELS

Race/Sex/Reading Levels		Mean	Std. Dev.	Cases
For Entire Population		14.4273	3.2561	220
Race	Black	14.3421	3.0796	114
Sex	Male	14.0926	3.0854	54
Level	1 Low	14.7895	2.5944	19
	2 Ave.	14.0417	3.5689	24
	3 High	13.0000	2.6077	11
Sex	Female	14.5667	3.0828	60
Level	1 Low	14.0556	3.0428	18
	2 Ave.	14.6000	3.4998	30
	3 High	15.2500	3.3609	12
Race	White	14.5189	3.4482	106
Sex	Male	14.5082	3.5385	61
Level	1 Low	14.9231	3.6847	13
	2 Ave.	14.9643	3.2828	28
	3 High	13.6000	3.7892	20
Sex	Female	14.5333	3.3615	45
Level	1 Low	16.0000	2.6458	3
	2 Ave.	14.2857	3.6884	14
	3 High	14.5000	3.3278	28

TABLE 7

ATTITUDE LEVELS OF MOTHERS BY

RACE, SEX, AND READING LEVELS OF STUDENTS

Race/Sex/Reading Levels		Mean	Std. Dev.	Cases
For Entire Population		13.3042	3.4429	208
Race	Black	13.3056	3.7478	108
Sex	Male	13.3077	3.5510	52
Level	1 Low	14.8333	2.9155	18
	2 Ave.	12.0833	3.1611	24
	3 High	13.5000	4.6007	10
Sex	Female	13.3036	3.9539	56
Level	1 Low	13.5000	2.9665	16
	2 Ave.	12.4286	4.4757	28
	3 High	15.0833	3.3967	12
Race	White	13.4900	3.0961	100
Sex	Male	13.4035	3.1896	57
Level	1 Low	13.3846	2.4677	13
	2 Ave.	13.1852	3.7625	27
	3 High	13.6047	3.0011	17
Sex	Female	13.7647	2.7957	43
Level	1 Low	14.3333	4.1633	3
	2 Ave.	13.1538	2.9957	13
	3 High	13.7407	2.9819	27

TABLE 8

ATTITUDES OF BLACK MALE STUDENTS
BY READING LEVELS ACCORDING TO THE
KRUSKAL-WALLIS ONE-WAY ANOVA

Kruskal-Wallis One-Way analysis of variance by ranks of levels: Attitudes of Black male students.

Levels	Cases	Mean/Rank	Probability
Low	19	30.61	
Average	24	27.90	0.2858(N.S.)
High	11	21.27	

TABLE 9

ATTITUDES OF WHITE MALE STUDENTS
BY READING LEVELS ACCORDING TO THE
KRUSKAL-WALLIS ONE-WAY ANOVA

Levels	Cases	Mean/Rank	Probability
Low	13	33.08	
Average	28	33.04	0.4312(N.S.)
High	20	26.80	

TABLE 10

ATTITUDES OF BLACK FEMALE STUDENTS
BY READING LEVELS ACCORDING TO THE
KRUSKAL-WALLIS ONE-WAY ANOVA

Kruskal-Wallis One-Way Analysis of variance by ranks of levels: Attitudes of Black Female students.

Levels	Cases	Mean/Rank	Probability
Low	18	27.67	
Average	30	31.33	0.6917(N.S.)
High	12	32.67	

TABLE 11

ATTITUDES OF WHITE FEMALE STUDENTS
BY READING LEVELS ACCORDING TO THE
KRUSKAL-WALLIS ONE-WAY ANOVA

Levels	Cases	Mean/Rank	Probability
Low	3	28.33	
Average	14	21.82	0.7356(N.S.)
High	28	23.02	